Census 2000 ZCTAs™
ZIP Code Tabulation Areas
Technical Documentation

2000

USCENSUSBUREAU

Helping You Make Informed Decisions

DEPARTMENT OF COMMERCE
UNITED STATES OF AMERICA

Part 1: Technical Description

The ZCTA technical documentation consists of four parts:

Part 1 introduces the concept of a ZCTA and describes its technical characteristics.

Part 2 outlines the automated ZCTA delineation methodology used for Census 2000 products.

Part 3 discusses census data products that include ZCTAs.

Part 4 provides information for contacting the Census Bureau for further information, and to purchase Census 2000 products.

Introduction and Definitions

ZIP Code Tabulation Areas (ZCTAs) are approximate areal representations of United States Postal Service (USPS) ZIP Code® service areas. The Bureau of the Census created ZCTAs to meet requests by data users for census data by ZIP Code area. ZIP Codes are, in fact, attributes of addresses. The term ZCTA was created to differentiate between true USPS ZIP Codes and these areal approximations.

The Bureau of the Census used a new, automated methodology to delineate ZCTAs for Census 2000 data products. ZCTAs are created by using ZIP Codes associated with addresses collected during census operations and stored in the Census 2000 Master Address File (MAF). ZCTAs generally represent the majority ZIP Code for MAF addresses within a Census 2000 tabulation block, the smallest area for which the decennial census provides data. Where no ZIP Codes are available for a block, the assignment process spatially extended ZCTA coverage from an adjacent area to cover the block. Figure 1 illustrates a simple, fictitious example of ZIP Codes and ZCTAs for an area.

For Census 2000 products, ZCTAs have the following basic characteristics:

1) Every tabulation block has a single ZCTA code;
2) ZCTAs cover all tabulation blocks for all 50 states, the District of Columbia, and Puerto Rico;
3) ZCTAs may consist of two or more discontiguous areas;
4) A ZCTA code represents a five-digit USPS ZIP Code where possible;
5) In large undeveloped areas where there are no MAF addresses with five-digit ZIP Codes, the ZCTA code assigned is based the three-digit ZIP Code with an "XX" suffix.
6) Water features may have the ZCTA code of the surrounding land area, or a ZCTA code based on the three-digit ZIP Code (from the nearby land area) with a suffix of "HH".

The Census Bureau designed the ZCTA as a single-layer statistical entity to support simple tabulations of census data. Unlike census tracts and other program-defined entities, ZCTAs are based on addresses and their USPS ZIP Codes existing at the time of the census. Because ZIP Codes are subject to change, ZCTAs will not remain stable over time.

A ZCTA might not exist for every valid USPS ZIP Code. In most cases, the excluded ZIP Code identifies a single-delivery point location for which the Census Bureau had insufficient information to establish a distinct ZIP Code service area.

In summary, the Census Bureau has created full ZCTA coverage for the United States and Puerto Rico. In doing so, the delineation process extended ZCTA coverage to areas with no ZIP Code or addresses. The delineation process attempted to assign a full five-digit ZCTA code to every unassigned area. These extensions eliminated some of the spatial fragmentation that resulted from creating ZCTAs using the available addresses alone. Even with extension, ZCTAs may consist of discontiguous parts. Where reliable data were unavailable for extensive areas, the ZCTA code may be based on the more general three-digit ZIP Code with an "XX" suffix.

Distinction Between ZCTAs and ZIP Codes

There are some significant differences between actual ZIP Codes and ZCTAs. Figure 1 illustrates the difference between them for the same area. Figure 2 focuses on one neighborhood, illustrating in detail the difference between the ZIP Codes for individual addresses and ZCTAs for individual blocks (this example is realistic, but does not represent an actual area or real addresses).

The USPS assigns ZIP Codes to delivery points to facilitate mail delivery. ZIP Codes belonging to city-style (house-

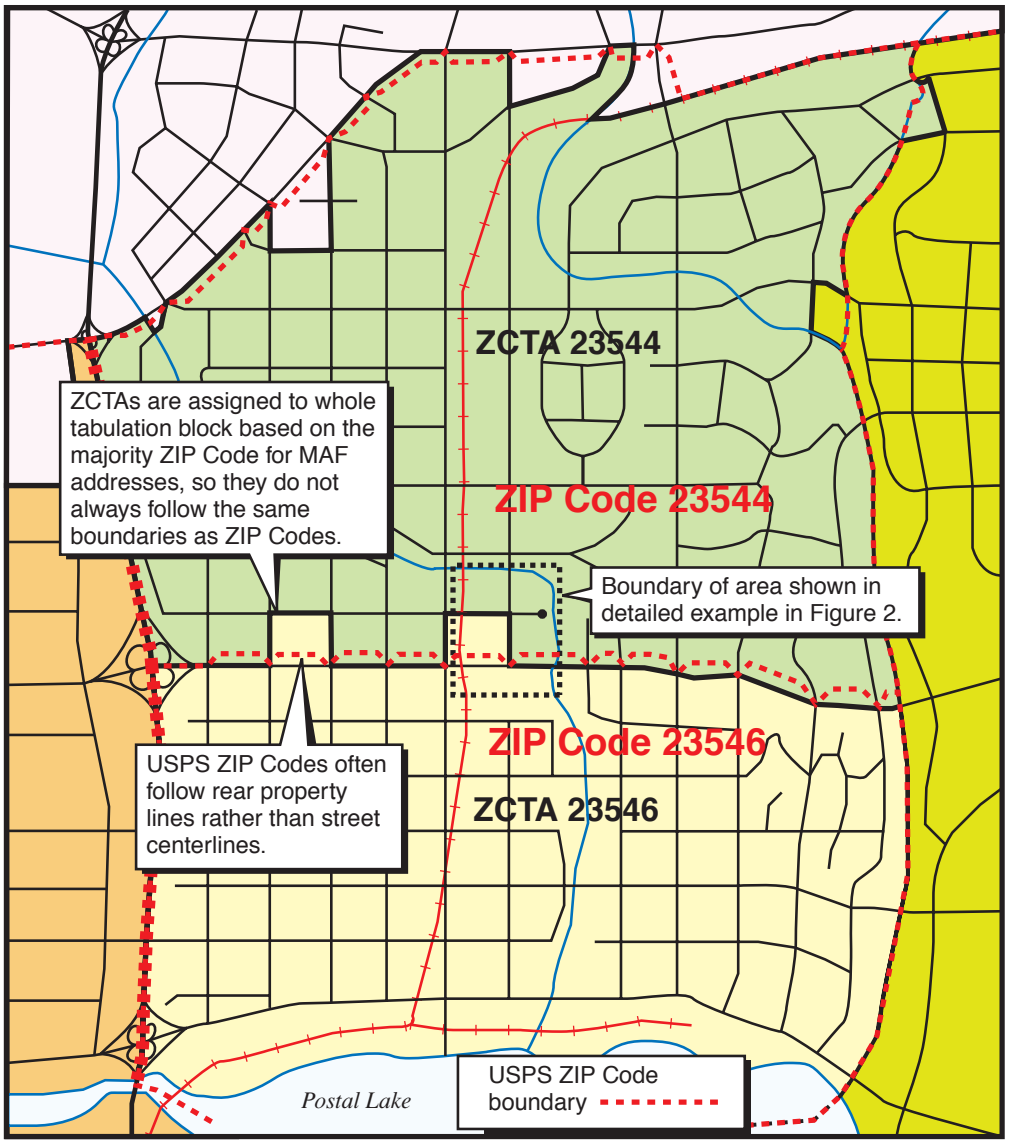


Figure 1: **Comparison of ZIP Codes and ZCTAs for an area**

(This example is fictitious)

number/street-name) and rural delivery addresses generally extend along delivery routes that follow the street network. Addresses on opposite sides of a street almost always have the same ZIP Code. However, addresses located on cross-streets may have different ZIP Codes. Therefore, ZIP Codes may split census blocks.

Boundaries of ZIP Codes often follow imaginary lines that are offset from the block face, such as a property lines. Rural addresses may be dispersed a considerable distance away from the mail delivery point located along the road, making it harder to define an offset boundary.

In Figure 2, the USPS assigns ZIP Code 23546 to addresses along both sides of Pine Rd. and ZIP Code 23544 to streets to the north, including 11th St., which intersects Pine Rd. If one were to to draw a boundary between the two ZIP Codes (the dashed line), it would parallel, but be offset from, Pine Rd.

Addresses with dedicated P.O. Box ZIP Codes may be dispersed over a wide area that is served by ZIP Codes for other types of delivery (611 Fir St. in Figure 2 receives mail at P.O. Box 124 with a ZIP Code of 23584). These ZIP Codes have no semblance of boundaries, and are usually considered delivery point locations rather than areas. Because these ZIP Codes exist in areas that are served by other ZIP Codes, the Census Bureau does not create a ZCTA for them. Instead, the ZCTA is based on the street or rural route delivery ZIP Code that serves most of the addresses for the area.

Some rural communities may have only dedicated P.O. Box ZIP Codes. In these cases, nearly all of the addresses in a

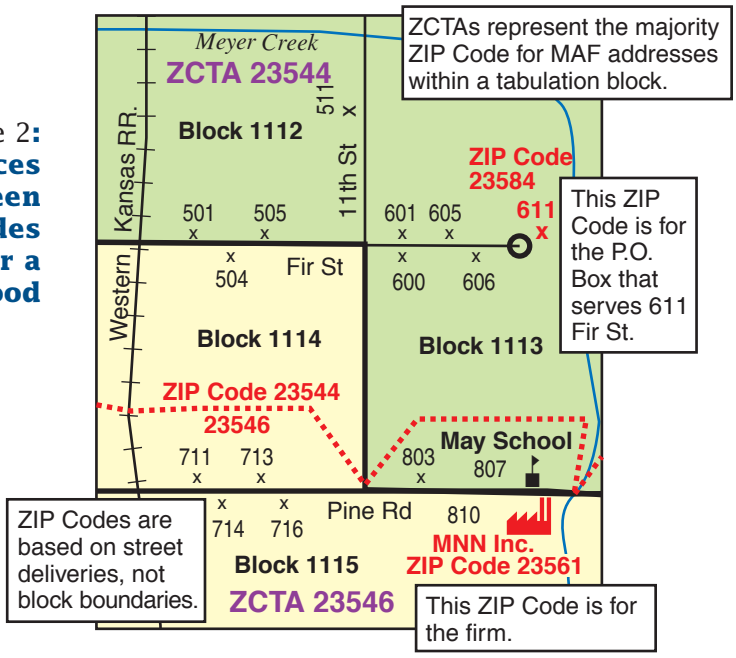


Figure 2: **Differences between ZIP Codes and ZCTAs for a neighborhood**

Part 1: Technical Description

post office's service area will have a P.O. Box ZIP Code. Because other ZIP Codes do not serve the same area, the Census Bureau can define a ZCTA for the P.O. Box ZIP Code.

Some individual firms and organizations have their own dedicated ZIP Codes, depending on the volume of mail they receive. The Census Bureau considers these ZIP Codes to be point ZIP Codes (representing a single delivery point) rather than areas, even though the land area covered by these organizations can be extensive. As a result, these ZIP Codes will not become ZCTAs. MNN Inc. in Figure 2 represents such a delivery type.

ZCTAs represent generalized ZIP Code service areas rather than the ZIP Codes assigned to individual delivery points. Because ZCTAs follow census block boundaries, a block may contain addresses with more than one ZIP Code. The ZCTA Code will not represent the ZIP Codes associated with some addresses in the block. Statistics based on tabulation by mail-delivery ZIP Codes will not be the same as those calculated based on ZCTAs.

Data users should never substitute a ZCTA for a mailing ZIP Code when using address range or address list information.

ZCTAs should not be confused with the ZIP Codes associated with street address ranges in the TIGER data base (stored in Record Type 1). These ZIP Codes are tied to particular address ranges for a street segment side, not to individual MAF addresses, as with ZCTAs. Most of these ZIP Codes are derived when Census Bureau regularly matches the TIGER data base with the USPS's ZIP+4 File.

ZCTA Codes

The Bureau of the Census identifies a ZCTA with a five-character alpha-numeric code. For ZCTAs that reflect a full five-digit ZIP Code, the last two characters of the code are numeric. For example, the ZCTA code "00601" represents five-digit ZIP Code "00601." The ZCTA delineation process does not recognize codes ending in "00," such as "29000," as valid five-digit ZCTA codes. Figure 3 is an example of the different ZCTA codes.

Five-digit generic land ZCTAs exist only where the three-digit ZIP Code is known. These codes will have a suffix of "XX" to fill out the full five digits. For example, "223XX" represents the balance of the three-digit ZIP Code "223" where a specific five-digit ZIP Code is unavailable.

Generic land ZCTA codes are used where the ZCTA coverage must extend into large unassigned land areas. The USPS probably does not provide five-digit ZIP Code delivery service to these areas. The use of the three-digit ZCTA code indicates there is insufficient information to determine the five-digit codes for individual blocks; it avoids overextending the surrounding five-digit ZCTAs.

Unassigned land areas covering contiguous areas of more than 25 square miles generally receive a generic ZCTA code with an "XX" suffix. Smaller areas are assigned the five-digit code of the adjacent ZCTA. In a few cases, smaller areas may carry the generic three-digit ZCTA code because they represent an isolated uninhabited area; for example, an isolated island that is a national park or seashore.

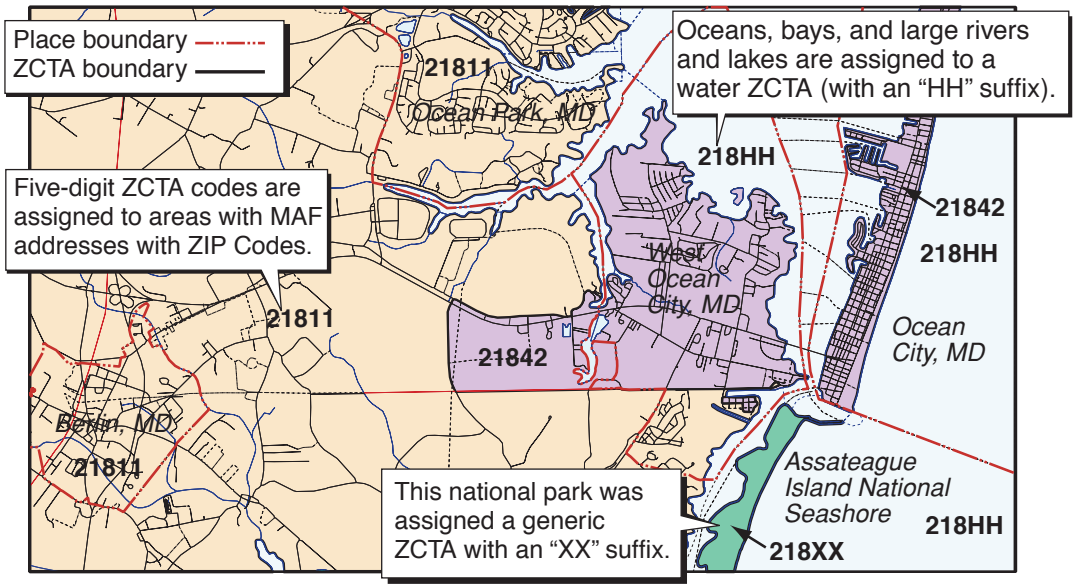


Figure 3: **Different kinds of ZCTAs**

Even though no addresses are assigned to water features, every block must receive a ZCTA code that is appropriate for its geographic area. Water features may show a variety of different ZCTA codes. Figure 4 shows how ZCTA codes were assigned to different kinds of water features.

Inland water features that share the same tabulation block number with the surrounding land area have the same ZCTA code as the land area within the block. These water features may have a five-digit code or a three-digit code with an "XX" suffix, depending on the ZCTA codes of the surrounding area. In Figure 4, two small ponds receive the ZCTA code of the tabulation block that surrounds them.

For coastal water, the Great Lakes, and some large inland water features, the ZCTA code will be the nearest adjacent three-digit ZCTA followed by the letters "HH". Large water features and coastal waterways may be split between several three-digit ZCTA codes. Blue Hill Bay and Seal Cove in Figure 4 are examples of ZCTAs assigned to coastal water.

Water features that border five-digit ZCTAs may also have a three-digit ZCTA code with an "HH" suffix if they are larger than 0.25 square mile. The intent is to prevent large lakes or long rivers or streams from distorting the shape and extent land-based ZCTAs. Seal Cove Pond in Figure 4 is an example of an inland water body assigned a water ZCTA with an "HH" suffix.

Very small lakes or ponds along the edge of two or more ZCTAs may have a land ZCTA code, such as "04679" or "046XX", to avoid creating unreasonably small ZCTAs. Table 1 summarizes the criteria for assigning ZCTA codes to water features.

Figure 4: **ZCTA Codes on water features**

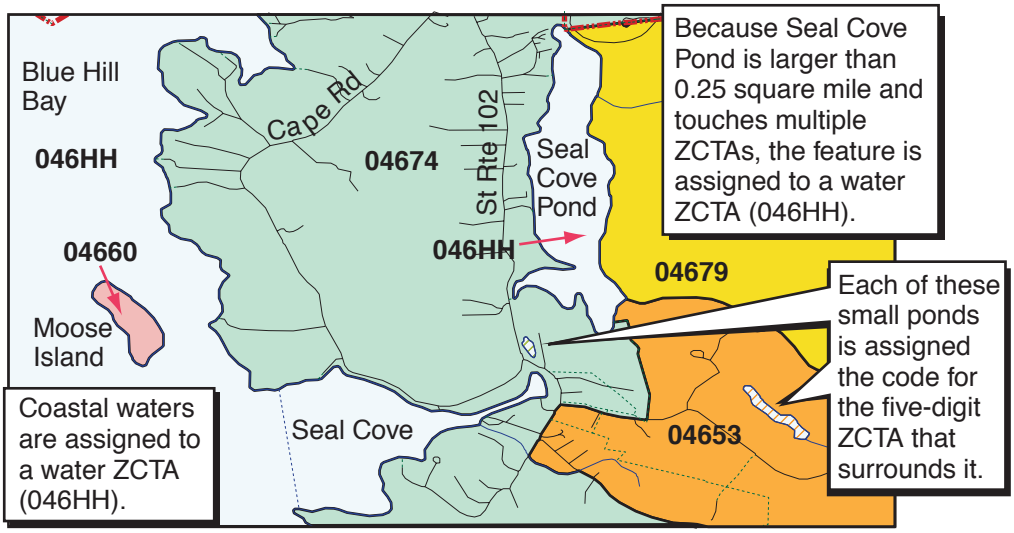


Table 1: **ZCTA Codes for Water Features**

Type of water feature	ZCTA Code
Territorial, coastal, Great Lakes	3-digit+HH ZCTA code
Inland features ≥ 10 square miles*	3-digit+HH ZCTA code
Inland features bordering 2 or more ZCTAs and > 0.25 square mile*	3-digit+HH ZCTA code
Other features	variable**

* Based on contiguous water area for the feature within a county or statistically equivalent area.

** All remaining water features receive either the same ZCTA code as the surrounding or adjacent land sharing the same tabulation block as the water area, or a ZCTA code extended from the surrounding area.

ZIP Code Content

As stated earlier, not all ZIP Codes may qualify as ZCTAs. The delineation process includes a filter to eliminate the following codes:

1) ZIP Codes that are not valid USPS codes anywhere in the country;
2) ZIP Codes unique to firms or organizations;
3) Discontinued ZIP Codes;
4) ZIP Codes invalid for the state and county (according to the USPS ZIP+4 File); and
5) Dedicated P.O. Box ZIP Codes associated with post offices with either city-style or highway contract or rural route delivery.

The delineation process validates each address ZIP Code using ZIP Code-County relationships derived from an

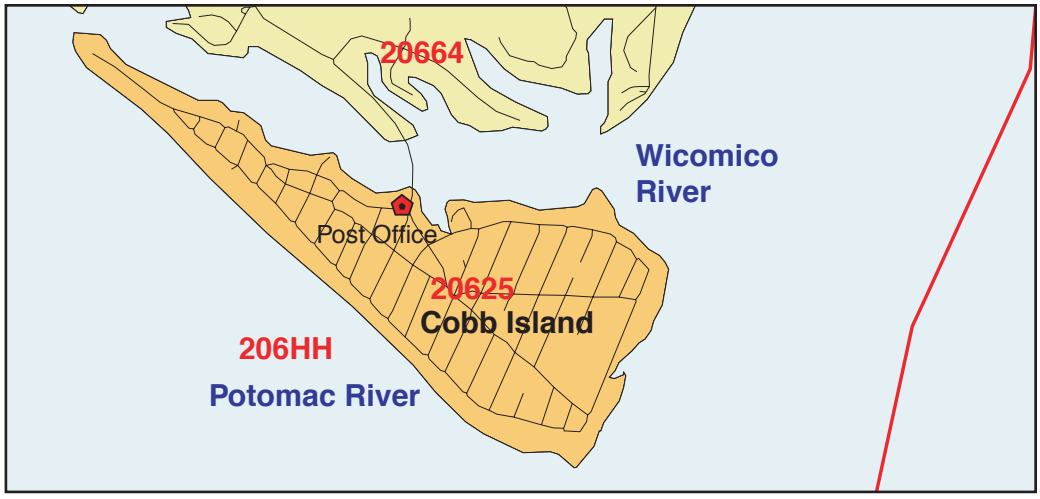


Figure 5:
P.O. Box-only ZCTA

unduplication of the USPS ZIP+4 File. Additional ZIP Codes and relationships from the USPS City-State File supplemented this information. The information on delivery type and discontinued status comes from the USPS Delivery Type File. During the delineation process, the Census Bureau added some additional ZIP Code-County relationships based on addresses collected during Census 2000 operations.

The validation process uses USPS files released for January 2000. These files are consistent with the address information collected or verified during Census 2000.

The Census 2000 ZCTAs include about one-third of the dedicated P.O. Box ZIP Codes. In these cases, the main post office provides only P.O. Box service or exclusive P.O. Box ZIP Code service within a quarter mile of the post office and rural delivery service outside this area. A ZCTA based on these ZIP Codes represents an area where the majority of addresses are served by P.O. Boxes. These ZCTAs usually have small coverage areas that surround the post office. Figure 5 shows Cobb Island, MD (ZCTA 20625), where mail is delivered to P.O. Boxes within the post office. There is no street delivery in this area.

Where a post office has both dedicated P.O. Box ZIP Codes and ZIP Codes with other delivery types, the P.O. Box ZIP Codes compete with the other ZIP Codes. The ZCTA delineation process places a higher priority on non-P.O. Box delivery and will not create ZCTAs using the P.O. Box-only ZIP Codes.

The final ZCTAs for Census 2000 include interactive corrections. The Census Bureau changed some ZCTA assignments to eliminate widely separated ZCTA fragments. The changes typically involve small polygons (less than 0.4 square mile) that have only one or two addresses with ZIP Codes that are inconsistent with the surrounding area.

Part 2: Delineation Methodology

Overview of ZCTA Delineation

The purpose of the ZCTA delineation process is to assign a ZCTA code to each tabulation block (Figure 6). The process requires separate methodologies to:

1) Determine the ZCTA codes for tabulation blocks with addresses.
2) Extend ZCTA coverage to tabulation blocks with no addresses or ZIP Codes.
3) Run edits on ZCTAs and review the results of the process.

Where addresses are available, the delineation process determines the majority ZIP Code for a tabulation block. It uses the addresses that are geocoded to that block in the Census 2000 MAF. The process includes ZIP Code filters to eliminate inappropriate codes.

The extension of the ZCTA coverage to areas with no addresses or ZIP Codes involves several procedures that fill specific types of unassigned areas. These areas include:

1) Unassigned areas within a ZCTA;
2) Coverage gaps between ZCTAs;
3) Outlying areas with scattered pockets of addresses or no addresses;
4) Water features and islands.

Moving down the list, the assignment of codes becomes increasingly uncertain. In very rural areas with no available MAF addresses with ZIP Codes, the process cannot reasonably determine a five-digit ZCTA code, and therefore assigns a three-digit code with an "XX" suffix. Water features require special consideration. The codes for inland water features depend on the codes of adjacent land areas, and are assigned near the end of the delineation process. Attachment A outlines the processing steps of ZCTA building.

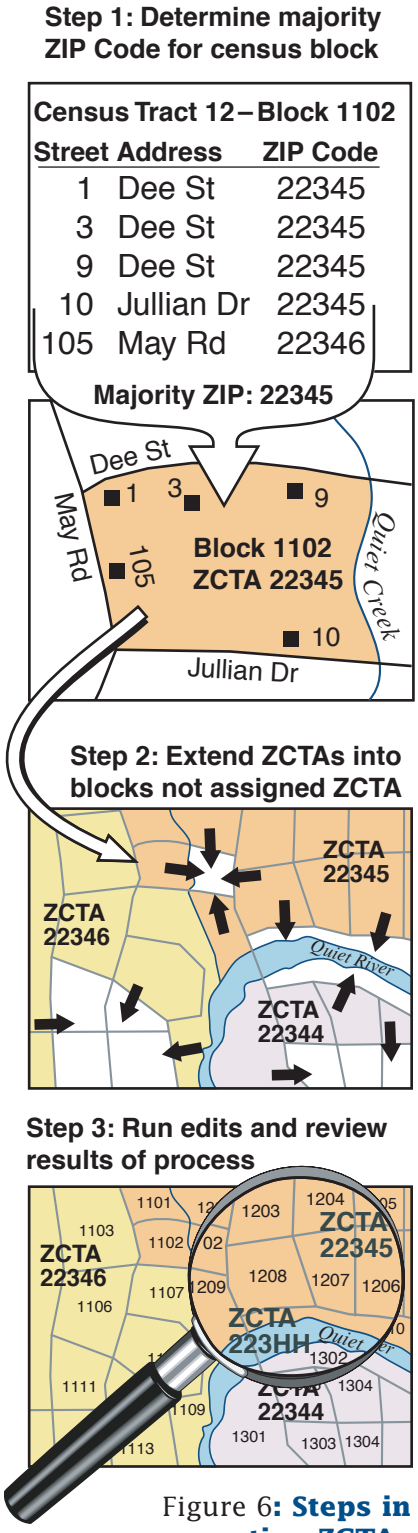


Figure 6: **Steps in creating ZCTAs**

Part 2: Delineation Methodology

Determining Majority ZIP Code

The ZCTA assignment strategy grew from the need to create generalized ZIP Code areas for summarizing census data, similar to the ZIP Code area summaries in the 1990 Census Summary Tape File (STF) 3B. Census 2000 ZIP Code areas were created by an automated process, using existing features in the Census TIGER data base as boundaries. These areas had to reflect ZIP Codes assigned to actual MAF addresses (the same address list used for census operations), which had been confirmed by USPS sources where possible. Every tabulation block would be assigned to just one ZCTA—even uninhabited areas with no MAF addresses with ZIP Codes, islands, and water blocks.

The first step in ZCTA delineation was creation of a ZCTA extract from the MAF. This extract included:

1) Residential and commercial addresses;
2) All types of addresses: city-style, non city-style (rural route, for example), and addresses identified only by a physical description; and
3) Within-structure addresses (for example, the apartments within an apartment complex).

The MAF extract excluded certain types of addresses:

1) Demolished, burned out, boarded up, or open to the elements
2) Non-existent (could not be found).
3) Duplicate
4) Vacant

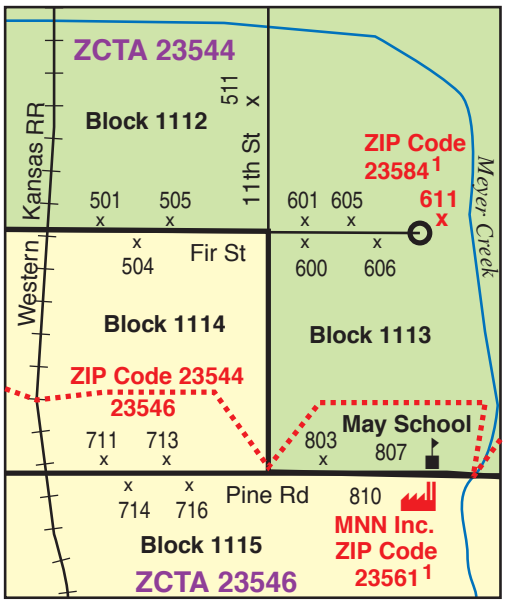
The MAF extract used the ZIP Code from the USPS Delivery Sequence File (DSF) for each address that had matched the DSF.

The ZIP Codes in the MAF extract were validated using ZIP Code-County relationships derived from an unduplication of the USPS ZIP+4 File; supplemented by the USPS City-State File and information based on addresses collected during Census 2000 operations.

For each collection block with one or more MAF addresses, the ZCTA build process:

1) Tallied the number of MAF addresses for each ZIP Code.
2) Determined the majority ZIP Code (the ZIP Code that was associated with the largest number of MAF addresses). The process prioritized MAF addresses confirmed by the USPS's DSF File.
3) If the match produced a tie, the program tallied MAF addresses that were both residential and DSF-confirmed to break the tie.
4) If there were too few DSF-confirmed addresses to calculate the first match, the program used the tallies for all MAF addresses within the block.
5) If all matches produced ties, the program selected one ZIP Code based on the ZCTA codes that surrounded most of the block.

Figure 7 examines the detailed area shown in Figure 2. It simulates addresses within the MAF, and shows how these streets, address ranges, and ZIP Codes might appear in the TIGER data base and USPS's ZIP+4 File. The MAF listing shows the process of determining the majority ZIP Code and identifies the ZCTA picked for each block. While this example is realistic, it does not represent actual information.



Information from the USPS ZIP+4 File

Street Name	L R[3]	R T[4]	Address Range	ZIP Code	+4
11th St	L	S	401-499	23544	11ND[5]
	R	S	400-498	23544	11ND[5]
	L	S	501-599	23544	1117
	R	S	500-598	23544	1118
Fir St	L	S	501-599	23544	1121
	R	S	500-598	23544	1122
	B	S	600-699	23544	1123
Pine Rd	L	S	701-799	23546	1234
	R	S	700-798	23546	1235
Pine Rd	L	S	801-899	23546	1113
	R	S	800-898	23546	1115
	L	F	807-807	23546	1132
	May School has its own +4 Code				
	R	F	810-810	23561[1]	Many[6]
	MNN Inc.–Large enough to have its own five-digit ZIP Code.				
PO Box	P		121-144	20584[1]	0121-0144
	This record includes 611 Fir St.				

[3] Street side: L = left, R = right, B = both

[4] Record Type: S = Street, F = Firm, P = P.O. Box

[5] A street side without deliveries may receive a ZIP+4 Code ending in "ND".

[6] The ZIP+4 File contains many records for a large facility, representing separate deliveries.

Information from the Census MAF

Tab Block	Address	ZIP Code	Tally	ZCTA
1112	511 11th St	23544		
	501 Fir St	23544	= 3	✓
	505 Fir St	23544		
1112			**3**	**23544**
1113	600 Fir St	23544		
	601 Fir St	23544		
	605 Fir St	23544	= 4	✓
	606 Fir St	23544		
	611 Fir St	23584	P.O. Box 124[1]	
	803 Pine Rd	23546		
	807 Pine Rd[2]	23546	= 2	
1113			**6**	**23544**
1114	504 Fir St	23544	= 1	
	711 Pine Rd	23546		
	713 Pine Rd	23546	= 2	✓
1114			**3**	**23546**
1115	704 Pine Rd	23546		
	706 Pine Rd	23546	= 2	✓
	810 Pine Rd	23561	Firm ZIP Code[1]	
1115			**2**	**23546**

[1] ZIP Code not represented by a ZCTA.

[2] May School is part of the tally for the minority ZIP Code 23546 in Block 1113.

Information from the Census TIGER Data Base

St Name	L R	Address Range	ZIP Code	Block
11th St	L	401-499	23544	1114
	R	400-498	23544	1113
11th St	L	501-599	23544	1112
	R	500-598	23544	1113
Fir St	L	501-599	23544	1115
	R	500-598	23544	1116
Fir St	L	601-699	23544	1113
	R	600-698	23544	1113
Pine Rd	L	701-799	23546	1114
	R	700-798	23546	1115
Pine Rd	L	801-899	23546	1113
	R	800-898	23546	1115

Note: These file examples are very simplified and represent realistic but imaginary addresses and postal deliveries.

Calculating the Majority ZIP Code:

ZCTA software tallies the number of MAF addresses assigned each ZIP Code for each census block. The ZIP Code with the largest tally becomes the ZCTA code for that block.

For block 1113:

- ZIP Code 23544 has 4 MAF addresses.
- ZIP Code 23546 has 2 MAF addresses.
- Therefore, ZIP Code 23544 is the majority ZIP Code and becomes the ZCTA code for this block.

ZIP Code 23584 is a P.O. Box ZIP Code, so it is not used in the process.

There are special procedures to deal with ties in the tallies.

Figure 7: **Determining majority ZIP Code and ZCTA assignment.**

This figure also shows how the TIGER data base, the MAF, and the USPS ZIP+4 File represent streets, street names, and addresses.

Part 2: Delineation Methodology

Overview of ZCTA Extension

The polygon extension begins once all possible blocks have been filled using the available MAF address with ZIP Codes. The process assigns codes to unassigned areas by using two approaches:

1) Polygon extension, which expands the existing ZCTA polygons outward to fill adjacent unassigned areas. Polygon extension moves outward in a series of steps, using the ZCTA codes from adjacent polygons that were previously assigned (Figure 8).
2) Interactive extension, which joins together fragments of five-digit ZCTAs that exist in rural areas otherwise covered by a generic ZCTA ending in "XX" (Figure 8).

Polygon extension stops when it reaches large unassigned rural areas (which carry an "XX" suffix), such as Jones State Forest west of Smith River in Figure 8. Polygon extension was used to assign the three-digit ZCTA code to these areas; the three-digit ZCTA polygons grow outward from the previously assigned five-digit ZCTAs.

Polygon extension respects water features as natural barriers and defers the assignment of codes to these features until all possible land area is covered (in Figure 8, Smith River received the three-digit ZCTA code of the nearest land + an "HH" suffix). Uninhabited island assignment is done after all land and water ZCTA assignment. These islands will generally receive the five-digit ZCTA code of the nearest five-digit ZCTA. In Figure 8, the uninhabited island in Smith River was assigned to the nearest five-digit ZCTA: 12346.

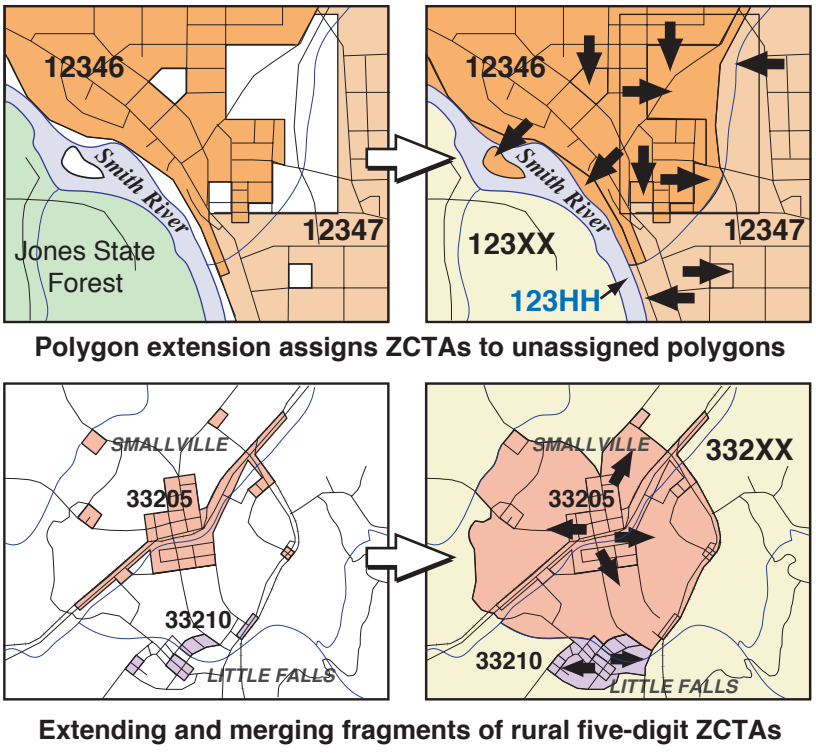


Figure 8: **Polygon extension of ZCTAs into unassigned areas, and extending and merging rural ZCTA fragments**

Specific Issues of ZCTA Building

Polygon Extension and Filling Coverage Holes

With the address-based ZCTA assignments in place, the delineation process begins to fill in the unassigned areas. The process will start by building land and water polygons: five-digit ZCTAs assigned by majority ZIP Code, large unassigned land areas over 25 square miles, water, and islands that have no MAF addresses with ZIP Codes. The process expands the five-digit ZCTA polygons outward to absorb unassigned areas, stopping at major water features and at the edge of large unassigned areas over 25 square miles.

The result of ZCTA polygon extension is the following:

1) Assigns codes to unassigned areas that are totally contained within a single ZCTA to that ZCTA (Figures 8 and 9).
2) Assigns codes to small unassigned areas that border the edge of a county and a single surrounding ZCTA (Figure 9).
3) Assigns ZCTA codes to unassigned areas between ZCTAs (Figure 8).
4) Assigns three-digit ZCTA codes with an "XX" suffix to large unassigned areas (Figures 8 and 9).

For each cycle of ZCTA polygon extension, the software evaluates every unassigned polygon that borders a five-digit ZCTA to determine the five-digit ZCTA that borders most of that polygon. The unassigned polygon is assigned to that ZCTA code. The result is that the process first fills polygons surrounded by one ZCTA, and also unassigned polygons between ZCTAs. Extension of each five-digit ZCTA stops at the county boundary, since delineation is a county-based

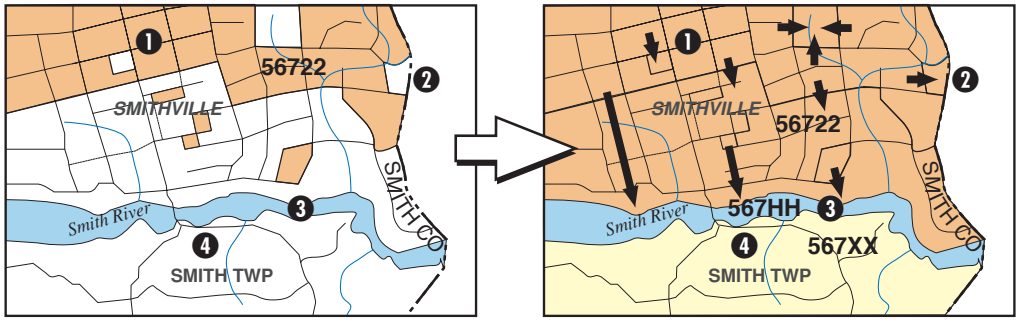


Figure 9:
Filling coverage holes, absorbing small ZCTA fragments, and assigning ZCTAs to unassigned areas

❶ Absorbing unassigned areas within a ZCTA.

❷ Extending a ZCTA to fill unassigned area that extends to the county boundary.

❸ Extending ZCTA 56722 outward until it reaches Smith River. Smith River will ultimately receive the three-digit ZCTA code + an "HH" suffix.

❹ Assigning a three-digit ZCTA + an "XX" suffix to a large area without MAF addresses with ZIP Codes.

process; at major water features; and at the edge of large unassigned areas flagged to prevent polygon extension.

The process flags large contiguous land areas larger than a 25-square-mile threshold, an arbitrary value based on limited observations. Because of the large size of rural blocks, the Census Bureau determined that automatically extending five-digit coverage into a buffer along the border of these generic areas did not always produce the desired effects.

Water areas remain as separate polygons that are excluded from the calculations (and the normal extension process used in land areas). This provision allows ZCTAs to expand outward to natural barriers such as rivers or lakes, but not beyond (Smith River in Figure 9 becomes a barrier for the extension of ZCTA 56722). It also prevents drainage features from connecting scattered unassigned land areas and forming large irregular areas that might be inappropriately excluded from five-digit ZCTA extension.

Polygon extension is a simple method that can expand ZCTAs to cover large areas with relatively little processing. During the development of the ZCTA delineation process, the Census Bureau tested the extension process in one area using Theissen polygons to allocate unassigned areas to ZCTAs and found the results comparable to polygon extension. However, the results of polygon extension are affected by differences in polygon size and become increasingly uncertain with each update cycle. To limit the extension of ZCTAs, the process blocks large unassigned areas from the extension process, as noted earlier.

Rural Fragments

If the USPS files indicate that all ZIP Codes in a county begin with the same three-digit code, all remaining unassigned areas automatically receive this three-digit code. Otherwise, the process assigns the ZCTA codes by extending out the first three-digits of established five-digit ZCTAs. The boundary between three-digit ZCTAs may not match the USPS three-digit ZIP Code boundary due to the ZCTA extension methodology.

Large unassigned areas may contain small isolated ZCTA fragments that represent one or more five-digit ZCTAs. The fragments may reflect small communities or isolated homesteads. Rather than surround these fragments with a three-digit ZCTA, they were joined to form a contiguous ZCTA polygon, if possible. During interactive review, discontiguous pieces were bridged if there was a logical travel path between them. In Figure 10, two five-digit ZCTAs were highly fragmented, so they were combined into contiguous ZCTA polygons. The reviewer connected fragments that would have a logical travel connection that a postal carrier might follow.

Large areas without MAF addresses or ZIP Codes are left with the generic three-digit ZCTA + the “XX” suffix. Note that any polygon extension used to join isolated ZCTA fragments may reduce the size of an area receiving a three-digit ZCTA below the 25-square-mile threshold. In addition, smaller uninhabited areas may also carry the generic three-digit ZCTA if the area is isolated from nearby ZCTAs. In Figure 10, the Rocky Hills area carries the generic three-digit ZCTA (with an “XX” suffix) because it is larger than 25 square

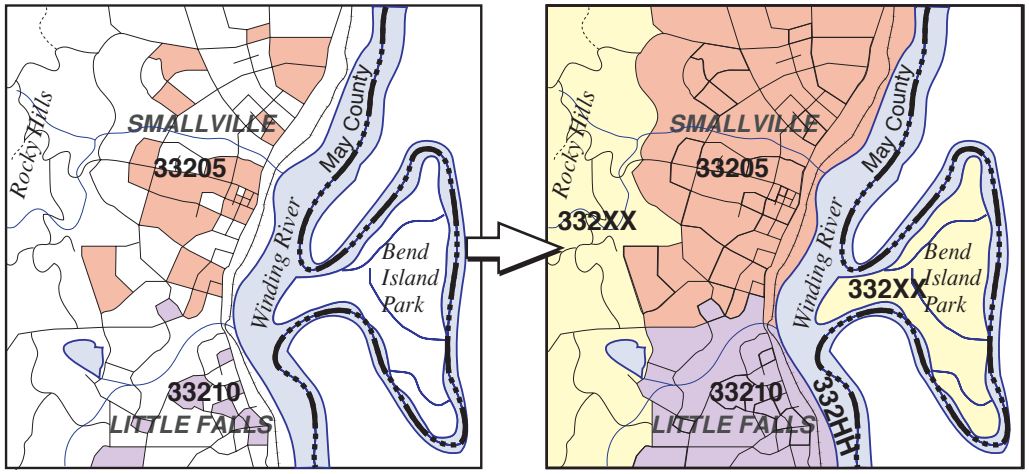


Figure 10: **Extending ZCTA coverage to incorporate rural ZCTA fragments**

miles and represents an unpopulated mountainous area. In Figure 10, Bend Island is smaller than 25 square miles but it was assigned the generic three-digit ZCTA because it is uninhabited and isolated from nearby five-digit ZCTAs.

Water Feature Edit

The ZCTA delineation process contains an edit for water features. All codes for water features generally come from an automated extension process. These features require ZCTA codes for tabulation purposes. The delineation process assigns codes to water features to avoid splitting tabulation blocks and to improve the ZCTA coverage for GIS applications. While ZCTA codes on inland water features within ZCTAs eliminate coverage holes, codes on coastal water features and along the boundaries of ZCTAs can distort the size and shape of a ZCTA. Rivers are particularly problematic, because the basic polygons comprising these features may run for miles and create highly irregular ZCTAs.

The water feature edit selectively changes the three- or five-digit ZCTA code to a water code depending on the type of area, the surrounding ZCTAs, and the feature size (see Table 1 on page 7). The edit initially identifies each contiguous water area as a distinct feature. Only inland water features may retain five-digit ZCTA codes. The process retains the three- or five-digit ZCTA codes (without using "HH") on features smaller than 0.25 square mile along ZCTA boundaries to avoid creating "micro gaps." Larger water bodies (greater than 10 square miles) and water bodies that are larger than 0.25 square mile and border multiple five-digit land ZCTAs receive the nearest three-digit land ZCTA code + an "HH" suffix.

Figure 11 shows ZCTA assignment for both coastal and inland water bodies. The coastal water received the three-digit ZCTA code of nearby land + an "HH" suffix. Joy Lake also received a water ZCTA code, because it was large enough and touched two different land ZCTAs. Smith Pond was assigned the ZCTA code of the surrounding land.

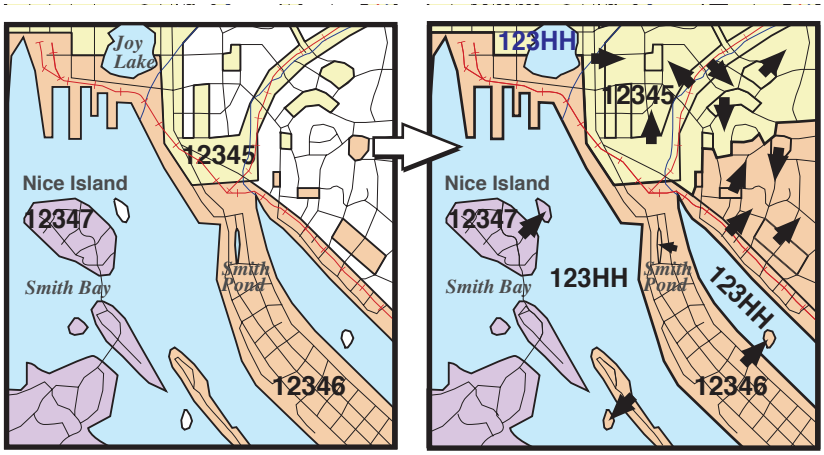


Figure 11: **Extending ZCTAs to fill fringe areas and to assign ZCTAs to water features and islands**

The assignment process may divide a feature between different three-digit + "HH" ZCTA codes where the water feature borders several three-digit ZCTAs. A good example is a long winding river that borders many three-digit land ZCTAs. In some cases, Census Bureau staff revised ZCTA assignments for water areas to correct inconsistencies; for example, if a long river was assigned both a three-digit ZCTA + an "HH" code and a five-digit ZCTA code.

ZCTA Assignment for Islands

After all land and water polygons are assigned, the ZCTA process assigns ZCTA codes to uninhabited islands. The process determines the closest land area assigned a five-digit ZCTA based on actual MAF addresses, and assigns this code to the island. In cases where the island is within a water body surrounded by a generic three-digit land ZCTA with an "XX" suffix, the island is assigned the same land ZCTA code. Figure 11 shows a number of uninhabited islands that were assigned the five-digit ZCTA code of the nearest land.

Interactive Reviews

Census staff reviewed ZCTA assignments to look for errors and inconsistencies in the automated ZCTA delineation. Among the situations reviewed:

1) Highly fragmented ZCTAs in areas with city-style addresses. In many cases; these fragments accurately represented the majority ZIP Code within these blocks. Some fragments represented so few actual addresses, Census Bureau staff decided to absorb them into the surrounding ZCTA. In other cases, staff were able to connect fragments to another piece of the same ZCTA. In a few cases, the fragment was a considerable distance from the rest of the ZCTA; often, those represented MAF addresses that had the wrong ZIP Code. These fragments were absorb into the surrounding ZCTA.

2) Extension of rural fragments with MAF addresses and ZIP Codes into contiguous ZCTA polygons. ZCTA assignment in these areas often resulted in numerous small fragments surrounded by the generic three-digit ZCTA (with an "XX" suffix). Staff extended ZCTA coverage along logical travel paths to create one ZCTA polygon, where possible. Staff also reviewed and made changes to the assignment of the generic three-digit ZCTAs, so that these areas represented large uninhabited areas with no MAF addresses with ZIP Codes.

3) ZCTAs that cross county boundaries. The pieces in each county were reviewed to see they were not small isolated fragments with just one address with that ZIP Code, and that the ZCTA pieces in each county were adjacent to each other, if possible.

4) Assignment of ZCTAs to P.O. Box-only ZIP Codes. Reviewers generally deleted those that had fewer than 10 MAF addresses assigned to that ZIP Code, or made sure that the ZCTA represented a compact area around a settlement.

5) Fixed visually obvious inconsistencies in ZCTA assignment.

Tabulation Block Edits

Before generating data products or summary data, the delineation process ran an edit to ensure that ZCTAs conformed to Census 2000 tabulation blocks. The delineation process used the MAF addresses geocoded to collection block to make the initial ZCTA assignments, because tabulation block numbering took place after the initial ZCTA delineation. Therefore, assignments based on address information might split tabulation blocks. In areas without address information, the ZCTA extension process made assignments by basic polygon and not by block, also creating the potential for some split blocks.

The edit resolved these situations using the following rules:

1) Select the ZCTA code based on the following hierarchy of updates:
   a) MAF-based.
   b) Interactive updates.
   c) Extension of ZCTAs.
2) Select the ZCTA code with the largest area, all else being equal.

Because of the configuration of some tabulation blocks, parts of some coastal waterways may have five-digit land-based ZCTA codes that would normally receive a generic three-digit + "HH" code. In these cases, the tabulation blocks include parts of small water features, islands, and coastal waterways, with a land-based ZCTA code. A land-based ZCTA code takes priority over a generic three-digit + "HH" ZCTA code.

The tabulation block edit was the final update operation before product generation. The edit produced a ZCTA-to-tabulation block equivalency file for data tabulations. The delineation process also built final ZCTA polygons used to produce the summary ZCTA data. The ZCTA-to-tabulation block assignment is stored in the Census Bureau's TIGER data base and then extracted for the TIGER/Line Files.

Figure 12 shows Census 2000 ZCTAs for Bay County, MI. This example shows ZCTA assignment for a urban area and the surrounding suburbs and rural areas.

Part 2: Delineation Methodology

Table 2: ZCTA 2000 Statistics

Delivery Type[1]	# of ZCTAs	Mean area[2]
No Deliveries	3	7.59
Non-Unique	28,785	89.27
P.O. Box Only	3,245	59.04
Unique	5	1.22
Total — Five-Digit ZCTAs	**32,038**	**86.19**
Water ZCTAs (HH suffix)	809	278.58
Generic Three-Digit + XX ZCTAs	331	1,865.25
Total for all ZCTAs	**33,178**	**108.63**

Number of five-digit ZCTA/state-county combinations: 32,038

Number of five-digit ZCTAs that cross county boundaries: 8,603

Number of five-digit ZCTAs that cross state boundaries: 42

Notes:

[1]**Delivery Type:** **No Deliveries:** ZIP Codes that are being discontinued, but that were associated with MAF addresses when ZCTAs were created.

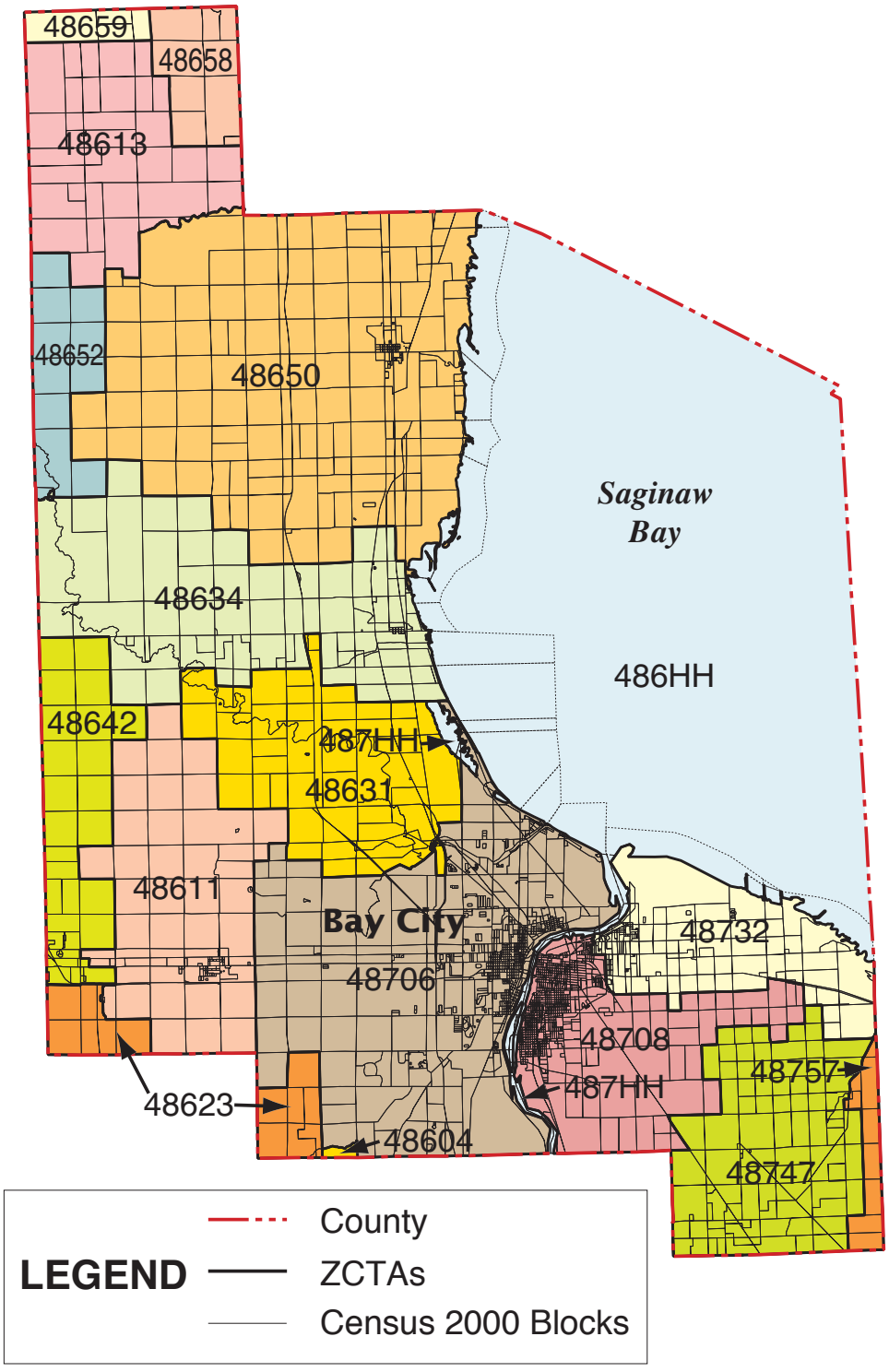
Non-Unique Delivery: Identifies post offices that have more than P.O. Box and General Delivery service, including city-style, contract carrier, rural route, and P.O. Box delivery service.

P.O. Box-Only Delivery: ZIP Codes that serve a post office that has only P.O. Box and General Delivery service.

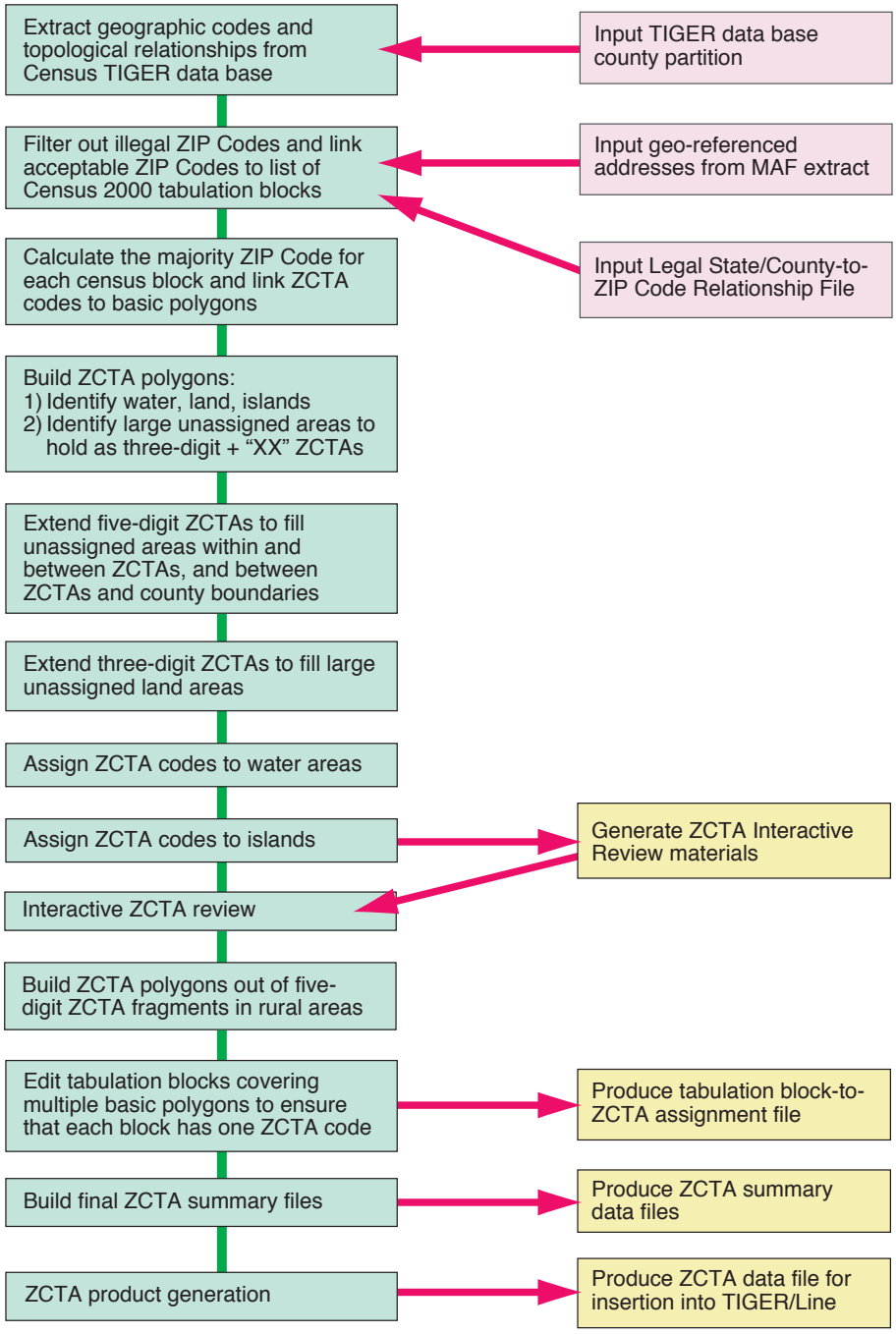
Unique Delivery: Deliveries to large firms and organizations (for example, a university).

[2]**Mean Area:** The average for each ZCTA category in square miles.

Figure 12:
2000 ZCTAs for Bay County, MI (Bay City)



Attachment A: **ZCTA Delineation Flow Diagram**



Part 3: ZCTA Products

United States Census 2000

TIGER/Line® is a registered trademark of the U.S. Census Bureau.

American FactFinder® is a registered trademark of the U.S. Census Bureau.

LandView® is a registered trademark of the National Oceanic and Atmospheric Administration.

Census Products That Include ZCTAs

Census 2000 TIGER/Line® Files:
ZCTAs for the United States and Puerto Rico are available in the Census 2000 TIGER/Line® files. ZCTAs are stored in Record Type S, which stores codes that relate to TIGER polygons.
For more information: http://www.census.gov/geo/www/tiger/

American FactFinder Internet site:
Users are able to plot ZCTA maps and create tables showing Census 2000 data tabulated by ZCTAs.
Web site: http://factfinder.census.gov/

Cartographic Boundary Files:
Generalized boundary files, including ZCTAs, that are appropriate for small-scale thematic mapping. These files are available for downloading from the Census Internet site in the following formats: ARC/INFO Export (.e00), Arcview Shape (.shp) and ASCII.
For more information: http://www.census.gov/geo/www/cob/

LandView® 5:
LandView® 5 is a desktop mapping system that includes database extracts from the Environmental Protection Agency, the Census Bureau, and the U.S. Geological Survey. These databases contain ZCTA boundaries along with jurisdictional boundaries; roads, rivers, and railroads, Census 2000 block group and census tract polygons; schools, hospitals, churches, cemeteries, airports, dams, and other landmark features. LandView is available on DVD format data disks with geographic files for the entire United States and Puerto Rico. The software runs on both Windows and MacIntosh computers.
For more information: http://landview.census.gov/

ZCTA Reference Maps:
Maps showing ZCTA boundaries are available for download from the Census Internet site (in Adobe PDF format) or as printed maps.
For more information: http://www.census.gov/geo/www/tiger/

Summary Files 1–4 (SF1–4):
Population and housing characteristics from Census 2000. Data will be tallied by ZCTA. SF1 and 2 contain the 100-percent data from the short census form; and SF 3 and 4 contain the sample data from the long form.
For more information: http://www.census.gov/dmd/www/2khome.htm

Part 4: ZCTA Contacts

Ordering ZCTA Products

Customer Services (Census Bureau)
Phone: 301-763-INFO (4636)
Fax: 888-249-7295 (fax orders only)
Web: https://catalog.mso.census.gov/esales4boc

ZCTA Product Information

Products and Services Staff (Geography Division, Census Bureau)
Phone: 301-457-1128 **Fax:** 301-457-4710
E-mail: zcta@geo.census.gov
Web: http://www.census.gov/geo/ZCTA/zcta.html